Remarks

Claims 1, 3 and 6 have been amended. Claims 1-8 remain pending. Applicants wish to thank the Examiner for the indication of claim 4 as allowable. A Petition for a one-month extension of the term is enclosed. Applicants further enclose a Change of Correspondence Address.

Applicants respectively traverse the Examiner's objection to claim 6. Claim 6 has been amended as suggested by the examiner.

Applicants respectively traverse the Examiners rejection of claims 1-3 and 6-8 as being obvious over Gitlin et al, US Patent No. 5,442,625 in view of Bi, US Patent No. 5,623,485.

The independent claims 1 and 6 are amended to additionally incorporate the feature that the bit rate of the orthogonal code for the sub-channel modulator (the first orthogonal code signal) is lower than that of the orthogonal code for the channel modulator (the second orthogonal code).

Purpose

Reference Gitlin

To raise a transmission data rate by M times.

This application

To provide a traffic channel with more data channels of low data rate, in order to efficiently use the traffic channel resource. Namely, a plurality of appliances can access the traffic channel through a plurality of sub-channels.

Summary

In the reference, when high transmission data rate is required, a plurality of sub-channels, the number of which corresponds to the number of a plurality of traffic channels available and not presently being utilized by other mobile units in a base station, are built in parallel, such that one source data of high data rate can be modulated through the plurality of sub-channels and transmitted through the plurality of traffic channels at a high data rate. But, in this application, only one traffic channel is assigned from the base station, a plurality of sub-channels, the

number of which corresponds to the number of appliances of low data rate trying to access the traffic channel, are built in parallel, such that a plurality of source data from the plurality of appliances can be modulated through the plurality of sub-channels and transmitted through said one traffic channel.

Configuration

Reference Gitlin

There are M sub-channels in each of which convolution coder, interleaver, Walsh modulator and code spreader are successively connected.

And, in the system in accordance with the reference, a serial-to-parallel unit for converting user's digital stream into M basic rate streams each of which is inputted to the M sub-channels, a combiner for combining outputs of M code spreaders, and a means for modulating the output of the combiner using a QPSK modulation are additionally equipped.

If a user has a primary code C1 assigned from the base station and requires a higher transmission data rate, additional codes, C2 ~ CM, will be derived from the C1. The codes of C1 ~ CM are orthogonal each other.

Each of the codes of C1 ~ CM is used in encoding or spreading each of the M basic rate streams inputted to the M sub-channels, respectively. And, each code carries a basic rate R.

Accordingly, output data rate of each sub-channel is identical to that of one traffic channel, that is, a basic rate R. And, because M sub-channels each of which outputs data at a basic rate R are connected in parallel, so the transmission data rate of M times the basic rate R can be provided.

As described in column 3, 26 ~ 30 lines, Walsh modulators shown in fig. 2 play no role in spreading or distinguishing outputs of M sub-channels from each other.

This application

There are N sub-channels comprising a sub-channel encoder and sub-channel modulator respectively.

And, a sub-channel summer for combining outputs of N sub-channels, a channel modulator, and a means for QPSK-modulating are additionally equipped.

A data rate of data inputted to each sub-channel modulator is lower than an encodable input data rate by a channel encoder divided by N (the number of sub-channels).

Sub-codes of f1 ~ fN (the first orthogonal code signal) used in the sub-channel modulators are orthogonal each other. So, outputs of the sub-channel modulators are distinguished from each other.

Each of the sub-codes has a predetermined data sequence respectively, and a data rate of the sub-code data sequence is equal to that of a data rate of data inputted to the channel modulator.

Each data inputted respectively to each of the sub-channels is modulated by a

corresponding sub-code, combined by the sub-channel summer, and subsequently modulated or spread by the primary code C1 (the second orthogonal code signal), assigned from a base station, in the channel modulator.

A variety of peripherals, such as PDA, notebook computer, voice phone, etc., requiring a low data rate can be connected to the sub-channels.

Examination

Common points

Both systems have a plurality of sub-channels, and each sub-channel comprises sub-channel encoder including convolution coder and interleaver, and sub-channel modulator.

And, data inputted to each sub-channel is modulated by a code(or function) orthogonal each other, and outputs of the sub-channels can be distinguished from each other.

Different points

Data inputted to sub-channels

Reference – Serial data from one source data, while being divided into M basic rate streams by the serial-to-parallel unit, is inputted into the M sub-channels.

This application – Data inputted to each sub-channel need not be inputted from one source data, because sub-channels can be respectively connected to different appliances.

Data rate of codes used in the sub-channel modulators

Reference – Data rate of C2 ~ CM is identical to the data rate of C1, which is a basic rate R, assigned to one traffic channel by a base station.

This application – Data rate of f1 ~ fN is lower than the basic rate R divided by N.

Total transmission data rate

Reference – M times the basic rate R which is the transmission data rate of one traffic channel.

This application – The basic rate R, because only one traffic channel (C1) is assigned.

The number of modulations for data inputted to each sub-channel

Reference - Data inputted to the ith sub-channel is modulated only once by code Ci (i = 1 ~ M) corresponding to the ith sub-channel. (It is mentioned that the Walsh modulator shown in Fig.2 may be eliminated to improve the bandwidth.)

This application – Data inputted to each sub-channel is modulated twice. It is modulated once by fi (i = 1 ~ M) corresponding to the ith sub-channel and sum of outputs of the N sub-channels is modulated once more by the code C1 assigned to the traffic channel.

Characteristics of C1 ~ CM and f1 ~ fN

C1 ~ CM – C2 ~ CM are codes additionally derived from the primary code C1 assigned from a base station. And the C1 ~ CM orthogonal each other are respectively used in modulating data inputted to the M sub-channels, so outputs from the sub-channels can be distinguished from each other. And, data rate of C1 ~ CM is equal to the data rate R.

f1 ~ fN – f1 ~ fN orthogonal each other are codes used in modulating data inputted respective sub-channels, and sub-channel outputs respectively modulated by the f1 ~ fN are distinguished from each other. And, data rate of the f1 ~ fN is lower than the data rate of the primary code C1, equal to the basic rate R, divided by N. The f1 ~ fN are codes entirely irrelevant to the primary code C1.

Summary

As examined above, reference and this application are different each other, in terms of the input data to sub-channels, the characteristics, function, and role of the codes, etc., and reference gives no teaching and no hint about the configuration of this application.

Effect

- ReferenceGitlin

  A user can optimally utilize an available bandwidth by varying transmission data rate into integer times of the basic rate R.

- This application
  - It is possible to efficiently use one traffic channel, by providing a plurality of data channels of low data rate within said one traffic channel.
  - Data can be transmitted more reliably in accordance with the increase of processing gain in correlation detection by using multiple modulations of sub-channels of low data rate.

Summary

In reference, by using the plurality of sub-channels built in order to transmit one source data at a high data rate, and the codes of C1 and C2 ~ CM additionally derived from the primary code C1, it becomes possible to efficiently use traffic channels available and not presently being utilized by other mobile units in a base station. But in this application, because, by using the plurality of sub-channels respectively connected to a variety of appliances of a low data rate and the new codes of f1 ~ fN, entirely irrelevant to the primary code C1, respectively corresponding to the plurality of sub-channels, outputs from the plurality of sub-channels can be distinguished from each other, so it becomes possible to efficiently use one traffic channel.

Accordingly, reference and this application are different each other in terms of the effects, and reference gives no teaching and no hint about the effects of this application.

Conclusion

- Independent claims 1 and 6
  - As shown in the appended claim amendment file, the bit rate of the first orthogonal code signal is lower than that of the second orthogonal code signal. But, in the reference GITLIN, the bit rate of the C1 ~ CM is same as that of the second orthogonal code signal. Namely, the code (the first orthogonal code signal) used in each sub-channel of this application is different from that (C1 ~ CM) of the reference in the bit rate point of view.
  - In this application, input data is modulated twice by the first and second orthogonal code signal. But, in the reference GITLIN, input data is modulated once by the Ci (i = 1 ~ M). Namely, the number of modulations for data inputted to each sub-channel is different each other between this application and the reference GITLIN.
  - The configurations and/or functions of each element of the independent claims 1 and 6 are different from those of the reference GITLIN, so the rejection on the claims 1 and 6 due to the deficiency of inventiveness over the references GITLIN and BI is not proper.
- Claims 2, 3, 5, 7, and 8 – if the independent claims 1 and 6 are admitted to have inventiveness over the references GITLIN and BI, the rejections on the claims 2, 3, 5, 7, and 8 depending on the claims 1 and 6 will be automatically arranged to be patentable.
- As argued-above, it is not proper to reject this application as lacking inventiveness over the references. Conclusively, it is proper that the rejection be withdrawn and this application be patented.

Please acknowledge safe receipt by return.

Applicants respectively traverse the Examiners rejection of claim 5 as being obvious over Gitlin et al, US Patent No. 5,442,625 in view of Bi, US Patent No. 5,623,485, and further in view of Odenwalder et al, US Patent No. 6,298,051. Claim 5 is allowable as it depends from claim 1.

In view of the foregoing comments, Applicants respectfully submit that the Examiner's rejection has been overcome and requests the Examiner reconsideration and allowance of the pending claims.

Respectfully submitted,

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